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Subject: Jackson County Phase I LFG
Date: Thu, 05 Feb 2004 14:32:52 -0500
From: Edward Mussler <Ed.Mussler@ncmail.net>
To: Jim McElduff <jmcelduff@altamontenvironmental.com>
CC: Jim Patterson <Jim.Patterson@ncmail.net>, Tim Jewett <Tim.Jewett@ncmail.net>, LARRY ROSE <LARRY.ROSE@ncmail.net>

Jim,
I have reviewed the proposed work plan for the LFG wells at the closed Jackson County landfill. I have two questions .
1. How will the lfg header lines be installed, above or below the cap system?

2. What is the plan for the liquid in the event it becomes necessary to turn one of the prospective lfg borholes into a leachate well?

Thank you for the submitted workplan. The Section will be able to respond on your request pending the answers received above.

If you have any question please feel free to contact me.
Regards,
Ed Mussler
Solid Waste Section
Division of Waste Management
919.733.0692 x 343

ALTAMONT ENVIRONMENTAL, INC.

ENGINEERING & HYDROGEOLOGY

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LARRY - FYI
LET ME KNOW IF
YOU HAVE ANY
CONCERN.
EP

January 23, 2004

Mr. Ed Mussler
North Carolina Department of Environment and Natural Resources
Division of Waste Management - Solid Waste Section
401 Oberlin Road, Suite 150
Raleigh, North Carolina 27605

Subject: Revised Landfill Gas Extraction Work Plan
Closed Jackson County Landfill
Dillsboro, Jackson County, North Carolina

Dear Mr. Mussler:

Based on recent conversations with you, Tim Jewett, and Larry Rose, Altamont Environmental, Inc. (Altamont) is submitting the enclosed Landfill Gas Extraction Workplan to your office. Altamont is working with Jackson County, North Carolina to plan and implement the extraction of landfill gas from the Closed Jackson County Landfill. Extracted gas will be put to beneficial use through the construction of a "Regional Arts and Crafts Center and Alternative Crops Development Station." This project represents a collaborative effort between Jackson County and several stakeholders in the vicinity.

As we discussed, Altamont is currently scheduling the tasks outlined on the project schedule. Extraction well installation is tentatively scheduled for the week of February 23, 2004. Altamont understands that you will review and approve this work plan, or request additional information. As the scheduled drilling date approaches, we will confer with you and Mr. Jewett to make certain that we have your approval prior to taking any action that would disturb the cap of the closed landfill.

Thank you for your assistance with this project. If you have any questions or need additional information, please call me at (828) 281-3350.

Sincerely,

ALTAMONT ENVIRONMENTAL, INC.

James S. McElduff, P.E.

cc: Tim Jewett, NCDENR Solid Waste Section
Larry Rose, NCDENR Solid Waste Section
James Patterson, NCDENR Solid Waste Section
Ken Westmoreland, Jackson County Manager

enclosure: Landfill Gas Extraction Workplan

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LANDFILL GAS EXTRACTION WORKPLAN
PHASE I

CLOSED JACKSON COUNTY MUNICIPAL SOLID WASTE LANDFILL JACKSON COUNTY, NORTH CAROLINA

Prepared for
Jackson County

January 23, 2004

Prepared by
Altamont Environmental, Inc.
78½ Patton Avenue
Asheville, NC 28801
(828) 281-3350

James S. McElduff, P.E.
Project Manager

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FIGURES

APPENDIX

1.0 INTRODUCTION

Altamont Environmental, Inc. (Altamont), on behalf of Jackson County, has prepared this *Landfill Gas (LFG) Extraction Workplan* for the closed municipal solid waste (MSW) landfill near Dillsboro, North Carolina. The site location is shown on Figure 1. The purpose of the work plan is twofold:

- To provide representatives of the North Carolina Department of Environment and Natural Resources (DENR) with adequate information to approve the project, and
- To provide Altamont staff and subcontractors with guidance while working in the field during installation of the LFG collection system.

The work plan was prepared using a memorandum provided to Altamont by Mr. Edward Mussler of DENR. The memorandum is titled "Permitting Guidance: Active Gas Collection Systems;" August 7, 1996. Although the guidance document was directed primarily towards gas collection systems being installed at active Municipal Solid Waste (MSW) landfills, many of the considerations are also relevant to closed landfills such as the one that is the subject of this project.

Altamont has previously worked with Jackson County, other area stakeholders, and the Landfill Methane Outreach Program (LMOP) to assess the viability of a LFG extraction project at the aforementioned landfill. On the basis of that evaluation, a determination was made to move forward with construction activities related to the extraction of LFG. This report details the impending work at the Dillsboro landfill, specifically the installation of LFG extraction wells.

Construction related to the project is scheduled to take place in two phases. Phase I will entail installation of a subset of the total anticipated number of extraction wells and limited infrastructure. This will allow Jackson County and Altamont to make an informed go/no go decision before committing resources to the full project. The project schedule for Phase I activities is attached as an appendix.

If the need arises for field activities that are beyond the scope of the currently planned work, those activities will be described in subsequent work plans, as necessary.

2.0 BACKGROUND

Jackson County, with the assistance of Altamont, has historically conducted compliance monitoring for LFG at the closed MSW landfill near Dillsboro, North Carolina. As part of the compliance program, Altamont submitted a LFG Mitigation Plan to DENR on September 28, 2001. The plan detailed a two-phased LFG mitigation pilot study for the northern (Phase I) and southeastern (Phase II) boundaries of the property. The purpose of the pilot study was to evaluate options for achieving regulatory compliance regarding methane concentrations.

A *LFG Extraction Pilot Study Report* describing activities and results of both phases of the study was submitted to DENR on May 10, 2002. The study identified issues related to achieving control of LFG migration along both of the property boundaries evaluated during the test. In the report, Altamont recommended a comprehensive evaluation of the LFG monitoring network, identification of data gaps, and evaluation of measures to increase the protection of human health as appropriate.

A comprehensive *Landfill Gas Evaluation Report* was submitted to DENR on March 5, 2003. This report evaluated the feasibility of extracting LFG for beneficial use purposes. This report, and subsequent conversations among Altamont, Jackson County, other potential stakeholders, and representatives of the LMOP concluded that the beneficial use of LFG was feasible. Since that time, Altamont has completed preliminary design of a LFG extraction system for the closed landfill.

3.0 PROJECT TEAM

Altamont Environmental, Inc., with an office in Asheville, North Carolina, is directing the LFG extraction project on behalf of the stakeholders involved in the project. Stakeholders currently include Jackson County, Western Carolina University, Southwestern Community College, and the Town of Dillsboro.

In addition, Altamont has developed a team of LFG specialists to implement technical aspects of the project. The following subcontractors, and the services they provide, are engaged on the project on an as-needed basis:

- ***Landmarc Technologies, Inc.*** has provided engineering design and specifications for components of the LFG extraction system. Landmarc Technologies, Inc., will continue to provide technical and health and safety guidance throughout the project.
- ***Anne Udaloy, P.G.***, has provided specific information regarding the technical and health and safety aspects of drilling LFG extraction wells.
- ***Shaw EMCON/OWT, Inc.*** will conduct onsite drilling activities under Altamont's supervision. Additionally, Shaw EMCON/OWT, Inc. may provide construction services related to the blower/flare facility and associated equipment.

4.0 PHASE I CONSTRUCTION

Construction activities related to LFG extraction will occur in two phases. After the first phase of construction, the system will be operated for at least two months prior to initiating the second phase. The second phase of construction will occur only if data collected during the operation of the system indicate a high likelihood of overall success, as defined in Section 5.0

Altamont intends to contract with Shaw EMCON/OWT, Inc. to install three LFG extraction wells. These wells, labeled as #1, #2, and #3 in Figure 2, will be installed to the approximate bottom of the landfill. Specifically, the following items will be involved in the installation of the three extraction wells:

Cap Protection

- Prior to construction of the extractions wells, take the necessary precautions to ensure the integrity of the existing landfill cap. Such precautions will include, at a minimum, the following measures:
  - Restricting use of vehicles on the capped portion of the landfill during periods of precipitation or other inclement weather that is conducive to damaging the cap.
  - Use of mud mats or similar equipment when soil moisture in the cap, combined with the planned activities, are conducive to damaging the cap.
  - Repair of surface abrasions on the cap if normal working activity damages the vegetative cover or the surficial soil. Such repairs may include raking soil to diminish tire tracks or other abrasions, reseeding small areas, and mulching or fertilizing the small areas requiring special attention.

Well Installation

- Construct wells, using a bucket auger rig, in accordance with details provided in Figure 3. Specifically, Altamont anticipates that the total depths of the wells will be 80-feet for well #1, and 90-feet for wells #2 and #3. The bottom one-third of each well will be screened.
- Perched leachate may exist in the landfill. If zones of leachate are encountered at depths less than 40 feet, then drilling will temporarily suspended. The borehole will be evaluated for use as a leachate extraction well. While drilling is halted, a submersible pump will be used as part of an effort to determine if the leachate is represents a small perched zone or a larger

more continuous area of saturation. Fifty-five gallon drums (DOT approved) will be used to contain leachate removed from the borehole.

- Drilling will continue after removal of perched leachate. However, if the characteristics of the leachate (e.g., depth and quantity) indicate an extensive area of saturation, then the borehole will be completed as a leachate extraction well.
- If leachate is not evident during installation of the LFG extraction well, then the well will be completed as shown in Figure 3.
- During drilling, at least one person will remain outside the work area in order to observe the potential effects of LFG on personnel working near the borehole. In the event that adverse effects are noted or Permissible Exposure Limits (PELs) are exceeded, the drilling location will be evacuated until conditions change.
- If concentrations of LFG pose a threat to Health and Safety, fans powered by an intrinsically safe generator will be utilized as necessary to dissipate the gas. Air quality will be monitored for carbon dioxide, methane, oxygen, hydrogen sulfide, vinyl chloride, and benzene with a GEM 500 LFG monitor and Draeger tubes, as appropriate.

Management and Disposal of Cuttings

- Drill cuttings will be placed in a lined, leak-proof container (e.g., dump truck or roll-off container). The cuttings will be transported to the Jackson County Transfer Station at Scotts Creek for disposal as MSW. This will be scheduled in advance with the Jackson County Solid Waste Technician.

Fire Prevention and Protection

- Prior to drilling activities, the local Fire Department will be made aware of onsite activities and the risks inherent in drilling in a landfill. Fire extinguishers will be made available during all onsite activities. All site workers will be made aware of the locations and proper use of fire extinguishers. In the event of a fire, the site will be evacuated and the local fire department will immediately be contacted.

Well Abandonment

- If well abandonment is necessary, the borehole will be filled with waste to a depth of approximately ten feet below the cap elevation. Five-feet of well-hydrated bentonite chips will be placed on top of the waste. The hydrated bentonite will then be covered by three feet of granular bentonite.

Cap Repair

- Spot repair of the cap will be completed in accordance with landfill closure documents submitted to DENR on May 1, 2002. Those documents described closure of the former C&D area of the same landfill. They were approved by DENR on July 24, 2002.

- In summary, from the top of the bentonite, the borehole will be filled with a one-foot layer of compacted soil, a compacted 18-inch clay layer (with a permeability of $\leq$ 10-5 centimeters per second), and a 6-inch layer of topsoil. Cap repair will be blended to match the boring to the original grade. A vegetative cover will be sown to match the surroundings.

Following installation of the three extraction wells, the following equipment will be purchased and installed. Figure 2 depicts approximate locations for the piping, blower, and flare assemblies.

Wellhead and Piping

- Three 1.5-inch wellhead control valves from CES-Landtec.
- Two four-inch PVC butterfly valves with Viton seals by Hayward Industries.
- Two four-inch rubber expansion joints by Holz Rubber or Proco Products.
- 6-inch and 4-inch SDR 17 HDPE pipe of grade PE38, cell classification of PE345434C or greater, as defined by ASTM D3350-02a, plus associated fittings. All pipe joining shall be thermal butt fusion except where flanged joints are shown on the plans.

Condensate Knockout

- Wright-Austin Type TS four-inch gas/liquid separator with associated piping and manhole sump.
- 150-gallon polypropylene tank for condensate storage.

Blower

- Cincinnati Fan Model HP, Series 1, Model HPD, Arrangement 4, 150-scfm, 22-inch W.G. static pressure at standard conditions, with drain plug.

Flare Assembly

- Flare, fabricated from four-inch diameter carbon steel pipe and plate.
- Enardo flame arrestor Model 71204/D-AAF.

If the three LFG extraction wells installed in Phase I are deemed to be successful, using criteria presented in Section 5.0, then an additional five LFG extraction wells will be installed. The blower and flare facility will be adapted, as needed, to accommodate a greater flow of LFG. Piping will be extended to

the five new extraction wells. Following installation of the complete gas collection system, as-built diagrams will be provided to Jackson County and the DENR.

5.0 PHASE I OPERATIONS

After installation of the three Phase I LFG extraction wells and associated infrastructure, the system will be operational. The system will be operated and tested daily for a maximum period of two months. During that period, the following tasks will be conducted:

1. LFG flow and major properties (i.e., methane, oxygen, carbon dioxide, and temperature) will be monitored at each wellhead on a daily basis.
2. LFG flow and properties will also be monitored at the blower/flare in order to assess the quality of the composite gas.
3. Gas extraction at each well will be adjusted to maximize flow while maintaining the following criteria:
    a. methane concentration greater than 40 percent,
    b. oxygen concentration at less than 5 percent, and
    c. temperature less than 120 degrees Fahrenheit.
4. Accumulation of condensate will be monitored daily. If the 150-gallon polypropylene tank fills, it will be emptied using a vacuum truck. The condensate will be treated and disposed of at the Tuckaseigee Waste and Sewer Authority (TWSA) Publicly Owned Treatment Works.

The wells will be monitored and adjusted until system equalization is achieved. System equalization is defined as the optimum flow continuing for at least five days without wellhead valve adjustment.

After system equalization has been achieved, the composited landfill gas will be sampled and tested for the US EPA TO15 list and siloxanes. The results of the TO15 analysis will be evaluated in combination with the daily test data in light of the following criteria:

- LFG quality and quantity
- System operational reliability and performance
- Updated system cost estimate

These combined results will be used to make a decision as to whether to proceed with Phase II activities.

FIGURES

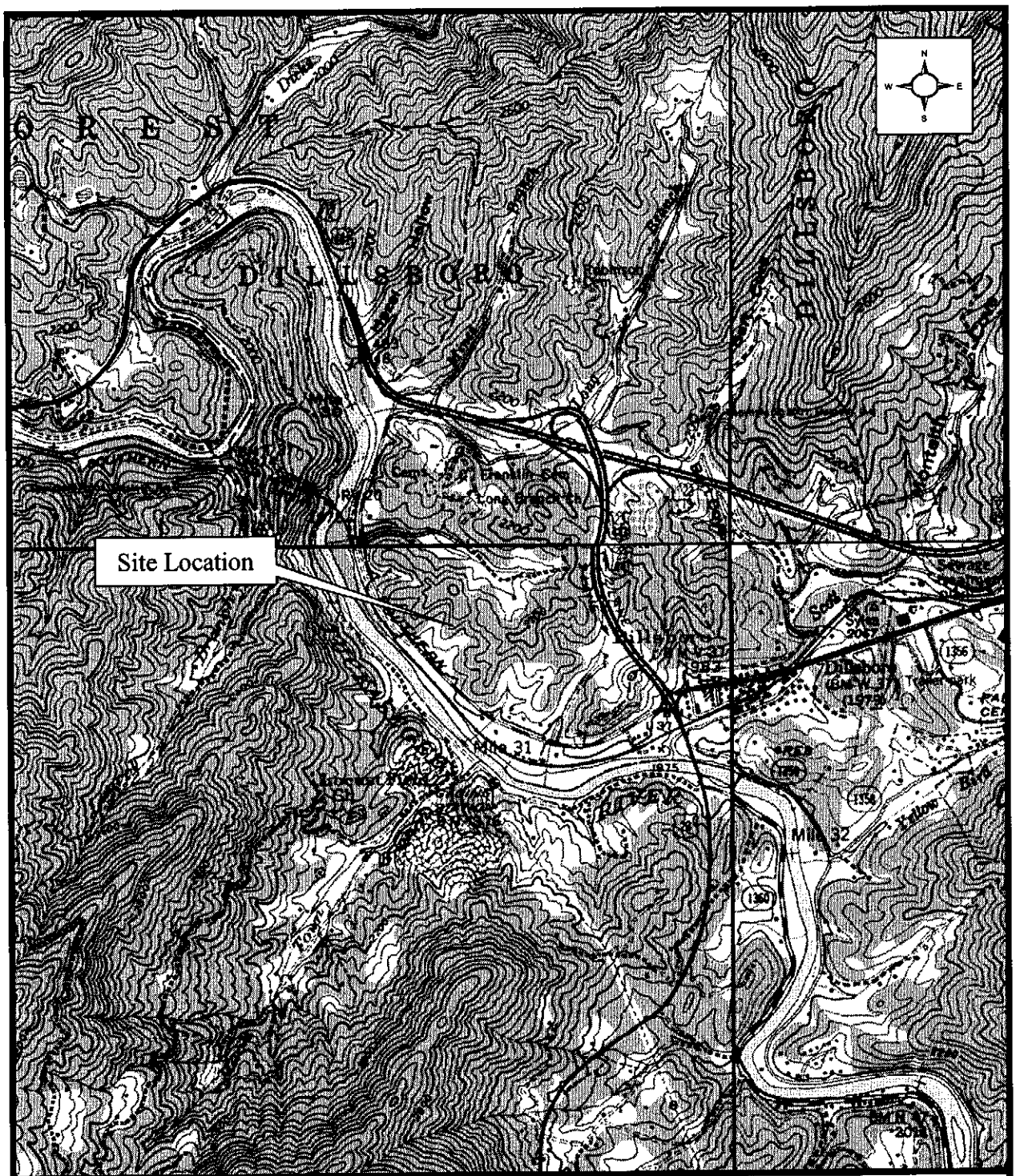

Figure 1
Site Location Map
January 23, 2004
USGS Greens Creek and Whittier Quadrangles

Scale 1 inch = 2000 feet

Dillsboro Landfill
Jackson County, North Carolina

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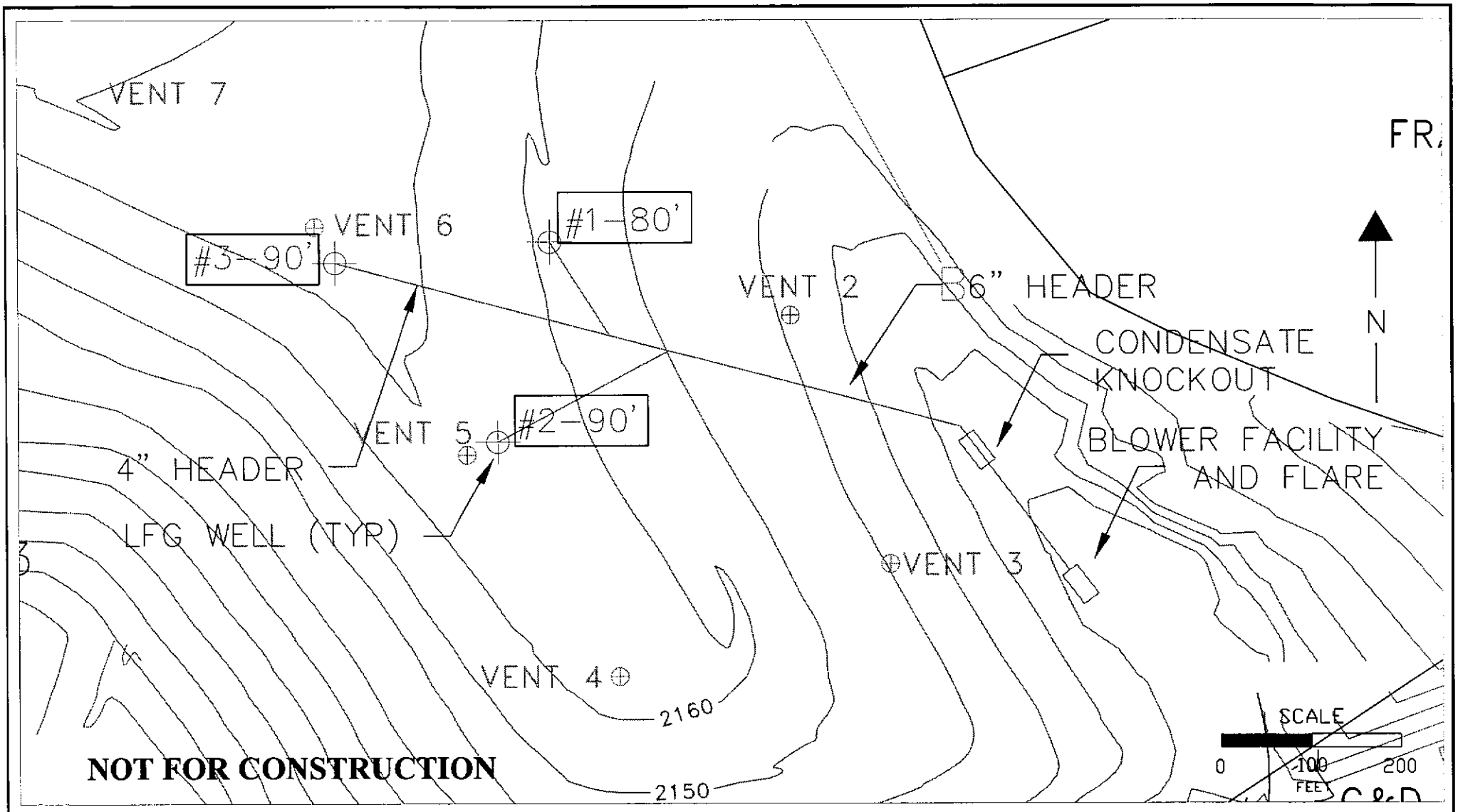
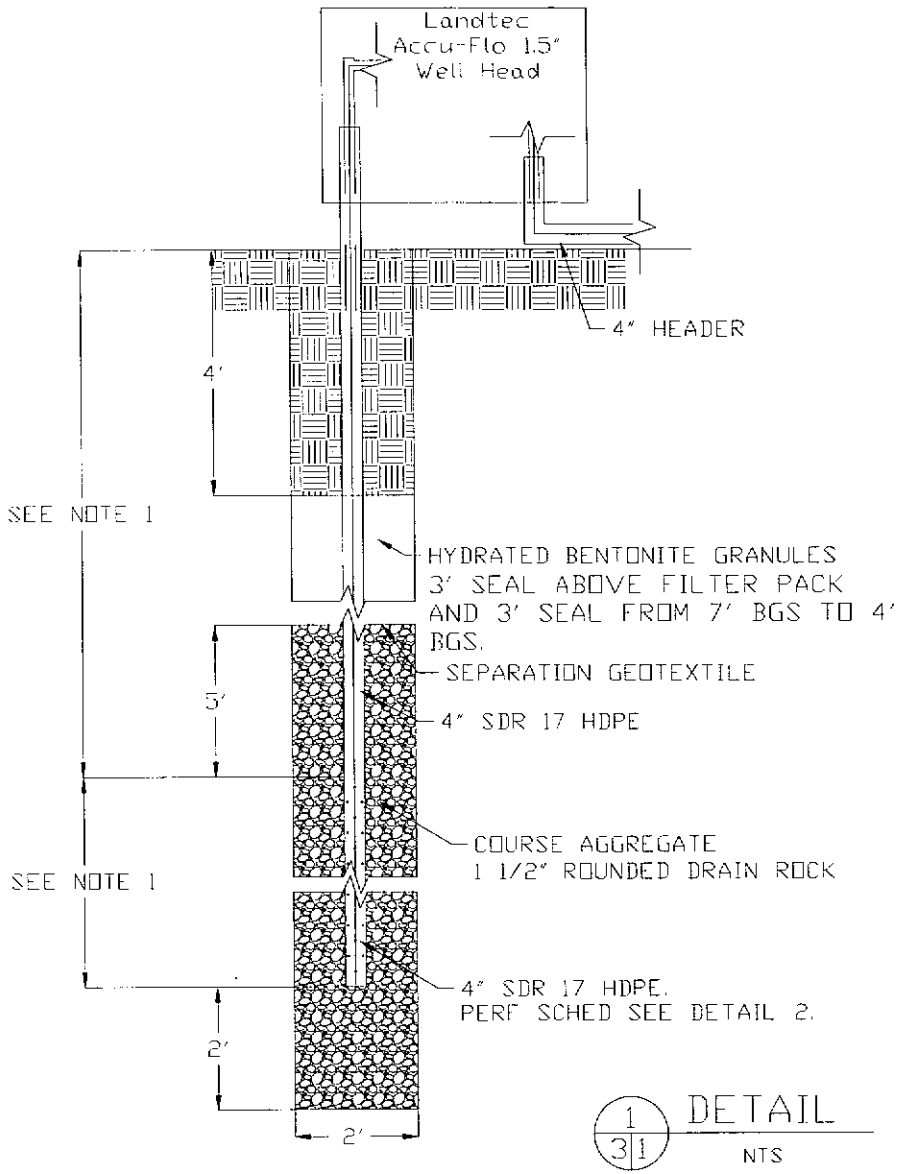


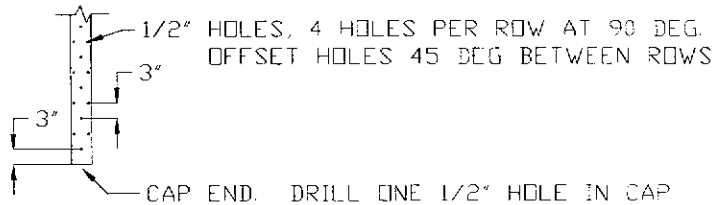
Landmarc Technologies, Inc. North Bend, WA (425) 888-5554	Altamont Environmental 78 1/2 Patton Avenue Asheville, North Carolina (828) 281-3350	Jackson County Landfill LFG Extraction System Layout – Phase I (Preliminary)		2/3



1/3 DETAIL
NTS

NOTES

1. #1-25' SCREEN, 53' CASING.
   #2-30' SCREEN, 58' CASING.
   #3-30' SCREEN, 58' CASING.



2/3 PERFORATION DETAIL
NTS

NOT FOR CONSTRUCTION

Jackson County Landfill
Landfill Gas Extraction Well Schematic

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North Bend, WA
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3
3

APPENDIX

Phase I Schedule of Tasks

Dillsboro Landfill - Landfill Gas Resource Development
Jackson County, North Carolina

Week of Project	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Date (January 2004 through May 2004)	Jan. 19	Jan. 26	Feb. 2	Feb. 9	Feb. 16	Feb. 23	Mar. 1	Mar. 8	Mar. 15	Mar. 22	Mar. 29	Apr. 5	Apr. 12	Apr. 19	Apr. 26	May 3	May 10	May 17
Installation and Testing of Extraction Wells																		
Provide work plan to DENR																		
Schedule driller																		
Preparation for drilling activities (Health & Safety)																		
Construct extraction wells																		
Fabricate flare																		
Deliver blower to landfill																		
Setup system																		
Operate and monitor for two months																		
Sample landfill gas																		
Review results																		
Update scope and cost of full scale system																		
Review economic feasibility with County																		
County decision regarding full development																		

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